U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Leavenworthia texana*

COMMON NAME: Texas golden gladecress

LEAD REGION: Region 2

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION:

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
___ Non-petitioned
_X_ Petitioned - Date petition received: 11 May 2004
_ 90-day positive - FR date:
_ 12-month warranted but precluded - FR date:
_ Did the petition requesting a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? Yes
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes
c. If the answer to a. and b. is "yes", provide an explanation of why action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species continues to be precluded by higher priority listing actions. During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).
___ Listing priority change
Former LP: ___
New LP: ___
Date when the species first became a Candidate (as currently defined): 8/17/97

___ Candidate removal: Former LP: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Brassicaciae (Mustard)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Texas

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: San Augustine and Nacogdoches counties, Texas

LAND OWNERSHIP: 100% private land.

LEAD REGION CONTACT: Susan Jacobsen, Regional Office, 505-248-6641

LEAD FIELD OFFICE CONTACT: Clear Lake (Houston) Ecological Services Field Office, Carlos Mendoza, 281-286-8282

BIOLOGICAL INFORMATION

Species Description: The Texas golden gladecress is a small annual member of the mustard family. The leaves are rosette-forming, and early ones have only an orbicular entire and remote terminal blade portion. Later terminal leaf segments are slightly to distinctly wider-than-long and usually distinctly lobed with angular teeth. Flowering is February-March. Early and mid-season flowers are on scapes 3-9 cm long, but later flowers are usually borne in a raceme on lateral decumbent branches. Sepals are 4-5mm long. Petals are 7-10 mm long, bright deep-yellow with only slightly darker yellow bases, and narrowly obovate. Older petals may have white tips. Seeds are nearly orbicular, 3-5mm in diameter, strongly flattened, and narrowly winged.

Taxonomy: Dr. M.C. Leavenworth (a U.S. Army medical officer) first collected the taxon in Choctaw County, Oklahoma, in 1835. The specimens were eventually named Leavenworthia aurea. Dr. Leavenworthia discovered and collected similar specimens near San Augustine (of San Augustine County) in 1836-37. E. J. Palmer collected the species in the same area in 1915 and 1918, followed by D.S. and H.B. Correll in 1961-1962. E.S. Nixon (Stephen F. Austin State University, Nacogdoches, TX) studied and mapped populations around San Augustine in 1979-1980. Dr. W. M. Mahler also studied collected specimens and their habitat, and eventually, in

1987, identified it as a separate species, *Leavenworthia texana*, and endemic to San Augustine County, Texas.

Habitat/Life History: The gladecress, along with the endangered white bladderpod (*Lesquerella pallida*), occurs only on the Weches outcrops of east Texas in San Augustine County. The Weches geologic formation consists of a layer of calcareous sediment, lying above a layer of glauconite clay up to 20 inches below the surface. The formation was produced by ancient Eocene seas 30 to 50 million years ago and is one of the most richly fossiliferous of the Coastal Plain, containing the remains of nearly 100 species of corals and crustaceans. It averages five miles in width as it parallels Highway 21 through north San Augustine and Sabine counties. Erosion of the complex has produced steep, flat-topped hills and escarpments, dissected by deep valleys. It has also created the unique ecology of bladderpod habitats: islands of thin, loamy, alkaline soils (pH 7-8), within the normally deep, sandy, acidic soils (pH 4-5) of the Pineywoods region. The glauconite layer of the Weches is impermeable to water, making the thin upper soils seepy and wet much of the year, but often hard and dry during the summer. This, and the alkalinity of the soils, produce conditions unique to Weches outcrops, generally supporting open-sun, herbaceous, and specialized plant communities. Down-slope seepage across Weches terraces may also be important to maintaining the hydrology required by the gladecress. Weches glades have some similarity to limestone glades in parts of Oklahoma and Alabama; caliche glades on the Texas Edwards Plateau; and the Catahoula barren communities of north Jasper and Newton counties of Texas. The environmental factors shared by these communities are shallow, calcareous soils; primarily open-sun conditions; herbaceous-dominated vegetation; and fluctuation from spring soil saturation to summer drought.

The open, seepy Weches glades support highly diverse plant communities. More than 100 species, representing at least 39 plant families, have been documented on Weches glades. Most are small, herbaceous, and either annuals or biennials. Besides the endemic bladderpod and gladecress, some species are found nowhere else in eastern Texas, or are uncommon in the Pineywoods. Populations of blazing star (*Liatris mucronata*), whitlow-wort (*Paronychia virginica*), and yellow evening-primrose (*Calylophus drummondianus*) lie more than 200 miles disjunct from their range on the Edwards Plateau, and purple prairie-clover (*Petalostemum pulcherrimum*) lies more than 135 miles from its central Texas range. Other species, such as blue waxweed (*Uphea viscosissima*) and spike-rush (*Eleocharis compressa*), reach the western extreme of their range here and are found nowhere else in Texas. More wide-spread species include Arkansas savory *Satureja arkansana*, baby's-breath (*Hedyotis nigrican*s), brown-eyed susan (*Rudbeckia triloba*), canary grass (*Phalaris caroliniana*), clasping-leaf coneflower (*Dracopis amplexicaulis*), corn-salad (*Valerinella radiate*), false aloe (*Polianthes virginica*), green-thread (*Thelesperma filifolia*), Indian plantain (*Cacalia plantaginea*), sandwort (*Arenaria patula*), stonecrop (*Sedum pulchellum*), white heliotrope (*Heliotropium tenellum*), wind-flower (*Anemone heterophylla*), wild geranium (*Geranium carolinianum*), and wild onion (*Allium* drummondi)i. Grasses include dropseed (*Sporobolus vaginiflorus*), little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), and six-weeks fescue (*Vulpia octoflora*). Trees and shrubs found at glade edges include eastern red cedar (*Juniperus virginana*), red buckeye (*Aesculus pavia*), roughleaf dogwood (*Cornus drummondii*), sugar hackberry (*Celtis laevigat*a), sweetgum (*Liquidambar styraciflua*), and white ash (*Fraxinus Americana*).

Historical Range/Distribution: The gladecress was historically recorded at 8 sites, all in a narrow line along north San Augustine and Sabine Counties, following the Weches formation. It has been more recently restricted to three natural locations, and one introduced population in Nacogdoches County.

Current Range/Distribution: Two historic locations have been lost to glauconite mining. No gladecress have been seen in recent years at other white bladderpod sites (Goetz, Blount #2, Miley, Watts, Williams #1 and #2). Gladecress appear to be restricted in occurrence to the outcrops themselves, as opposed to the bladderpod, which can colonize a substantial area surrounding an outcrop. This factor may render the gladecress even more imperiled than the bladderpod, which is currently listed as endangered.

Known sites are now restricted to two in San Augustine County, one in Sabine County, and one introduced population in Nacogdoches County.

1) Tiger Creek (Chapel Hill) site: less than 1/4 acre (0.1 hectare) between pasture fence and gravel road 1 mile southwest of Highway 21 in San Augustine County.

2) Kardell site: less than 100 square feet (9 square meters) on south side of Sunrise Road 0.7 miles south of Highway 21 in San Augustine County.

3) Geneva site: about 100 square feet (9 square meters) on west side of Texas Highway 21, 1.5 miles south of Geneva in Sabine County.

3) Simpson Farms site [introduced population]: about 200 square feet (18 square meters) 3 miles east of Nacogdoches on north side of Highway 21 in Nacogdoches County.

Population Estimates/Status

Tiger Creek site: 91 plants in 1999; 67 in 2000; 96 in 2001; 42 in 2003.
Kardell site: 490 plants in 1999; 96 in 2000; 520 in 2001.
Geneva site: 319 in 1999; 57 in 2003; 40 in 2005.
Simpson Farms site: 300 in 2001.

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range. Gladecress habitat has been impacted by highway construction, residential development, conversion to pasture and cropland, widespread use of herbiciding, and over-grazing. Two sites have been lost to glauconite mining. Some sites may also be vulnerable to the establishment of concentrated chicken production operations. Many of these operations have been recently established in San Augustine and adjacent counties but, to date, none of them immediately near gladecress sites. However, this could change. The primary current threat to remaining gladecress habitat is the continued and expanding invasion of nonnative and weedy shrubs and vines into Weches glades, converting them to dense shrub-thickets which preclude herbaceous growth. The most serious invaders are Macartney rose (*Rosa bracteata*) and Japanese

honeysuckle (*Lonicera japonica*), but also include Japanese brome (*Bromus japonicus*), Japanese bush-clover (*Lespedeza striata*), privet (*Forestiera ligustrina*), bermuda-grass (*Cynodon dactylon*), broomsedge (*Andropogon virginicus*), spurge (*Euphorbia spathulata*), blackhaw viburnum (*Viburnum rufidulum*), and ivy treebine (*Cissus incise*). Control measures (brush-clearing) carried out in 1995 resulted in reappearance of the gladecress after a 10-year absence at one historic site (which site?) and its discovery at a second site. Future control measures could have a similar effect at other historic locations. If these sites are not managed to protect the species, the gladecress faces extinction.

B. Overutilization for commercial, recreational, scientific, or educational purposes. Not known to be a factor threatening the gladecress.

C. Disease or predation: One current and four historic sites are currently used for cattle grazing, placing the populations at risk to predation and trampling.

D. The inadequacy of existing regulatory mechanisms. All populations are on private land. The Service is currently denied access to two sites, resulting in unknown status. Another site is currently grazed, with unknown impact. Protection measures for all plants are limited to some degree in Texas because of the large proportion (97 percent) of private land and the lack of State regulation of rare species. Listing the species will not change this situation; listed plant species are generally not protected on private land.

E. Other natural or manmade factors affecting its continued existence. Known gladecress sites are being heavily impacted by invasion of nonnative shrubby species, resulting in the loss of unique wetlands. All sites remain vulnerable to conversion to cropland or range, over-grazing, glauconite mining, and concentrated animal feeding operations (CAFO's). With only two sites of known status, the possibility of succumbing to some man-made or natural event is high. A drought during 1999 and 2000 had a pronounced effect on gladecress reproduction (Tiger Creek site declined from 91 to 67, and Kardell from 490 to only 96). Unless new populations can be discovered and protected by some measure, the gladecress will remain in danger of extinction. In addition, locating new populations is hampered by the absence of a comprehensive soil survey for San Augustine County. The designation of soil series and soil map units along the Weches formation is probably the most crucial need in effectively locating new habitat. Funding to carry out management actions to control nonnative invasives is currently scarce to non-existent.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

- This plant occurs within the same habitat system as the Federally endangered white bladderpod. Management activities (brush-clearing) carried out in 1995 for the bladderpod resulted in a return of the gladecress to one site after a 10-year absence, and its discovery at a second location. However, nonnative shrubs have again invaded these sites, limiting gladecress and bladderpod numbers.

- Field Office funds supported a 3-year status survey conducted by The Nature Conservancy of Texas (TNC), and that project is now complete. GPS coordinates were established for each known site for future surveys and monitoring. Existing habitat areas

were characterized and quantified for future comparison.

- TNC identified a total of 44 potential sites of occurrence with the use of GIS data, including aerial, geologic, and hydrologic data sources. Access was granted for about 14 of these sites, but little Weches habitat, and no new gladecress populations, were discovered.

- Gladecress seeds have been collected and placed in three state horticultural labs and the National Seed Storage Lab. A Conservation Agreement between our office and Stephen F. Austin State University (SFASU) has facilitated propagation efforts at their Pineywoods Native Plant Center for cultivation, research, long-term storage, and seed source for reintroduction efforts.

- The Nature Conservancy has completed the "Conservation Area Plan for the San Augustine Glades." The plan identifies the size and configuration of functional conservation units that will restore and maintain long-term viability of Weches communities. This is a vital step toward recovery and preservation of this rare habitat, and should guide the development of Candidate Conservation Agreements and other measures. However, funding will be necessary to fully implement protection measures.

SUMMARY OF THREATS: Known historical sites have been impacted by conversion to pasture and cropland, widespread use of herbiciding, and over-grazing. Two sites have been lost to glauconite mining. The primary current threat is the invasion of non-native and weedy shrubs and vines into Weches glades, converting them to dense shrub-thickets which preclude herbaceous growth. The most serious invaders are Macartney rose (*Rosa bracteata*) and Japanese honeysuckle (*Lonicera japonica*). However, control measures (brush-clearing) have proven to be very effective at reversing the downward trend of gladecress populations. If these or similar measures are not carried out, the gladecress faces extinction.

RECOMMENDED CONSERVATION MEASURES: Recommended measures include: 1) continued landowner contact of existing and potential sites; 2) extensive surveys of species and its associates; 3) continued searches for new populations; 4) development of Candidate Conservation Agreements; 5) implementation of management actions to control non-native invasives, if funding is available.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2***
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6

Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: The magnitude of threat to the gladecress is considered high at this time. It historically occurred at at least 8 sites in east Texas. It is now restricted to four sites involving a total area of less than an acre, and a total population ranging from as low as 163 to a maximum of 1000. Since they occur on private land, all sites are vulnerable to conversion to cropland or range or glauconite mining. All sites are currently affected by invasion of non-native plants, significantly reducing population numbers each year.

Imminence: The degree of threat is considered imminent at this time. All known sites are undergoing degradation by the incursion of non-native shrubs and vines, restricting growth and reproduction of the gladecress. With only four known sites, the gladecress remains extremely vulnerable to any natural event. Unless existing and new populations are adequately protected, and management actions implemented to remove non-natives, the gladecress will remain in immediate danger of extinction.

__X__ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes.

Is Emergency Listing Warranted? No. The landowners involved are aware of the importance of this species, and have been cooperative in maintaining the current land use at the remaining known sites. Listing the species will not change the degree of threat, since plants are not protected on private land. Pre-listing efforts to find additional sites, secure funds for management of known sites, and develop conservation agreements with landowners, should be the focus for the species at this time.

DESCRIPTION OF MONITORING: The last major survey conducted for the gladecress was in 2001, by The Nature Conservancy of Texas. No surveys were conducted in 2003 or 2004. Contacts with the landowners of these sites, however, indicated no planned change in land use or land ownership at that time. If work-load allows, the Clear Lake office and Texas Parks and Wildlife Department hoped to carry out surveys in early 2005 to determine population numbers and status of existing habitat.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: In August 2005, the Arlington Ecological Services Field Office issued a letter to Texas Parks and Wildlife Department asking for their comments on

candidate species in Texas. TPWD responded by letter on September 30, 2005. In their comments, TPWD agreed that this species is in dire straits, but provided no other comments. They support management actions for the species.

Indicate which State(s) did not provide any information or comments: NA

LITERATURE CITED

George, R.J., and E.S. Nixon. 1990. The herbaceous flora of three Weches formation outcrops in eastern Texas. Sida 14(1):117-127.

Mahler, W.F. 1981. Notes on rare Texas and Oklahoma plants. Sida 9:76-86.

Mahler, W.F. 1987. *Leavenworthia texana*, a new species from Texas. Sida 12:239-242.

Texas Natural Heritage Program element occurrence records. 1974-1988.

Turner, Rick. 2003. Conservation Area Plan for the San Augustine Glades. The Nature Conservancy.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Rich McDonald 11/17/2005
Acting Regional Director, Fish and Wildlife Service Date

Concur: August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do not concur:
Director, Fish and Wildlife Service Date

Date of annual review: October 2005
Conducted by: Carlos Mendoza